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Electronic Business

FOR MANAGEMENT IN ELECTRONICS, COMPUTER & SYSTEMS COMPANIES — WORL

JUNE 26, 1989

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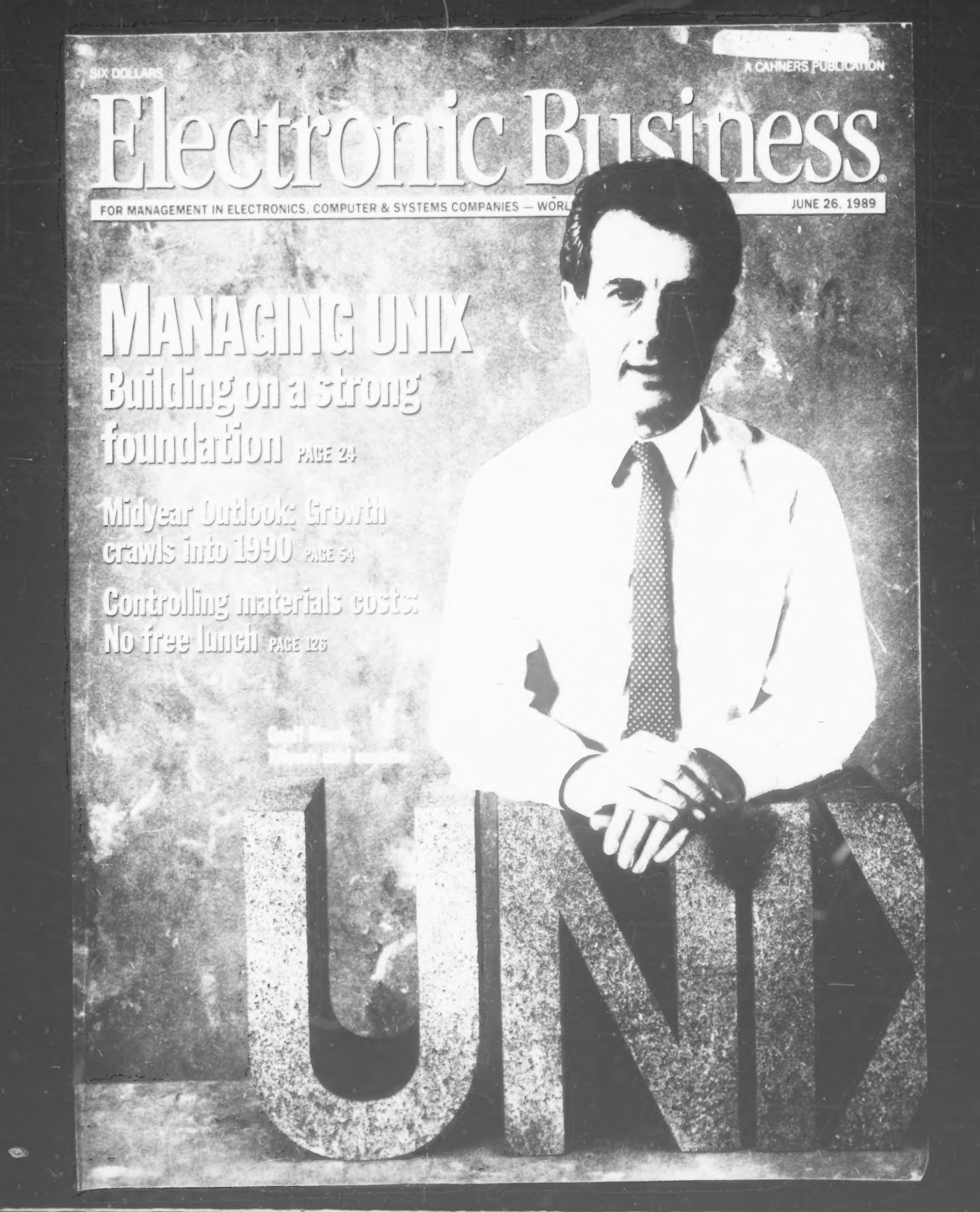

Electronic Business

FOR MANAGEMENT IN ELECTRONICS, COMPUTER AND SYSTEMS COMPANIES—WORLDWIDE

VOL. 15, NO. 13 JUNE 26, 1989

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For most of the 20 years since its creation, the Unix operating system has remained largely relegated to the technical world. But in recent months Unix has become one of the hottest — and most controversial — topics in the computer industry. The future direction of Unix as a standard has split vendors into two camps, each developing a competing version of the system. That leaves hardware manufacturers and software developers in a quandary about which direction to take.

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TI's pioneering work with users has opened up a market teeming with activity — digital signal processors. From fax machines to speech processing, DSP chips are cutting a wide swath through a number of new areas, and rivals want more of the action.

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X/Open plays the role of peacemaker

Where confusion and incompatibility now reign, the X/Open consortium offers what may be the best hope for bringing sanity and standards to the computer industry.

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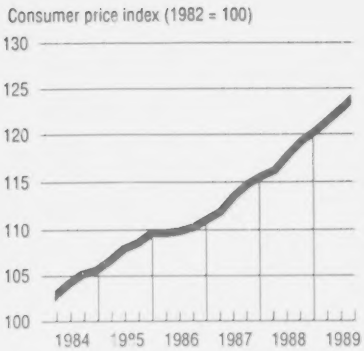

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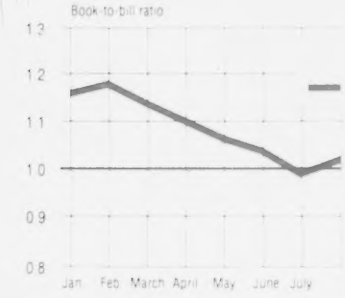

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We the people

A magazine is truly the sum of many parts — the editorial and art staffs, the production people, the advertising salespersons and the circulation personnel. Many people contribute to the magazine you are now reading. Some people get bylines and achieve a degree of fame, if not fortune. Others are largely unsung heroes, whose names may appear on the masthead to the left of this column.

Many of the folks listed on the left are also in the photo below, a picture taken in April following one of our rare meetings of the entire editorial staff. A few people are missing —Bill Cooke, our art director who was busy art directing a cover at the time, and Bruce Rayner, our man in Southern California who was on his way back to a looming deadline. We're also missing Mike Leibowitz, an associate editor; and Carla Aguilar Leeder, our associate art director; who both joined the staff after the photo was taken.

Which reminds me that the editorial and art staffs of magazines tend to be wonderfully fluid. Not only are good, creative people hard to find, but they are equally hard to keep. So with this issue, we say goodbye to two of the faces our picture — Anne Knowles, a senior editor who started with ELECTRONIC BUSINESS five years ago as an editorial assistant, and Sherri Hartlen, our current editorial assistant who has succumbed to the lure of working in downtown Boston. We'll miss them both.

By the time you read this column, we'll probably have people sitting in the cubicles that once housed Anne and Sherri. It's entirely possible that we might have some openings, too. If you have a journalistic background and enjoy writing about the business of electronics, drop me a line with a resume and a few of your best clips. You just could become one of our people.

The editorial staff

Whither electronics

Our research tells us that our readers value ELECTRONIC BUSINESS for our forecasts. In this issue, we present our Midyear Outlook which combines the efforts of several editors and several researchers with Cahners Economics, notably Elizabeth Baatz, Madeline Franchi and Julie Handelman. It's truly a team effort by many of the people who make ELECTRONIC BUSINESS informative reading. If you find the outlooks useful, write me a note — I'd like to pass your comments on to Liz, Maddy and Julie.

JEFF BAIRSTOW, executive editor

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BPA ABP

Chip makers chase TI in rapidly growing DSP market

As applications mushroom, prices drop and volumes soar for DSPs. But training and support are still key factors

For Texas Instruments Inc., the original developer and leading evangelist for digital signal processors, being on top of the market with an estimated 63% share has its problems. The higher you are, the better target you make. Thanks to its "missionary marketing" in DSPs, TI has created a tempting target in single-chip solutions. Although the market was a relatively modest $222 million last year, according to market research firm Forward Concepts Inc., of Tempe, Ariz., it is growing at a compound annual growth rate of more than 40%.

So, suddenly, competitors have rushed in, looking for a piece of the action. AT&T, Fujitsu Microelectronics Inc., Motorola Inc. and NEC Corp., to name a few, are joining the fray for single-chip DSP design wins. Although Dallas-based TI is hardly sitting by complacently, with over 50% more of the market than all its nearest competitors combined, it is unlikely to fall from the top for some time to come. But TI's early pioneering work with users has opened up a market teeming with activity.

From facsimile machines to speech processing and motor control, DSP chips are cutting a wide swath through a number of new areas, far from the traditional military or telecommunications applications. For example, General Motors Corp. is expected to replace the spring-based suspensions in 1990 Corvettes with adaptive electronic suspension systems based on four (one per wheel) 32-bit general-purpose digital signal processors driving hydraulic controls. The system is currently under development by Britain's Lotus Engineering, a recent GM acquisition. Complex automotive electronics could open up a huge market for DSPs, say some observers.

What makes DSPs so valuable to industrial and electronic systems designers is their single-minded focus on high-speed mathematical computations. Even the highly touted RISC microprocessors slow down as they struggle to crunch numbers in real-time. But DSPs can do a multiplication-and-add operation in a single clock-cycle, making them ideal for analog-digital conversions and real-time applications.

The early bird

TI, which began DSP development in 1979, had three things going for it that earlier makers lacked. First, TI was able to manufacture significantly high-speed parts — with clock cycles as fast as 200 nanoseconds — rapid enough to support applications that couldn't be served by regular microprocessors. Second, TI entered the market just as PCs were being widely adopted by engineers as inexpensive design platforms. And third, according to TI, the company knew it would have to educate the new market.

A few years ago, most engineering schools taught electronic engineering students how to design with standard microprocessors, but virtually no one offered classes in digital signal processing design. Today, largely through TI's efforts, the discipline of DSP design is taught at 200 universities.

TI's evangelism worked, securing it an estimated $140 million in sales last year, according to Forward Concepts president William Strauss. "We made a serious financial commitment with the long-term goal of turning [DSPs] into a profitable business," a TI spokesman explains. The DSP line is now "very profitable and we have been reinvesting the profits for many years," TI says. Michael Haimes, TI's DSP department manager, says the company today has about 10,000 general-purpose DSP customers who log in about 1,000 calls per month to TI's hotline.

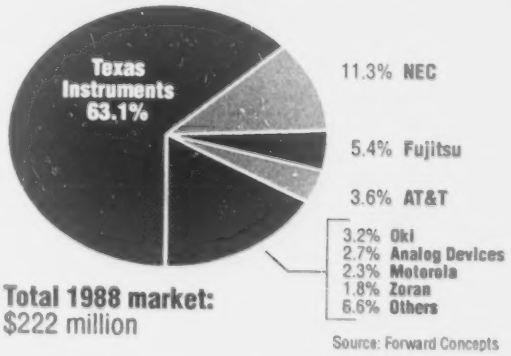
Friendly competition

NEC, which entered the merchant market the same year as TI, but without the same missionary fervor, achieved an 11% market share last year, according to Forward Concepts. Following NEC are Fujitsu Ltd. with 5% and AT&T with 4%. And although these companies are investing heavily in DSPs, Strauss contends that TI has a head start that may be hard to beat. "There is a long time between design win and volume production," he says. "It's at least two years. That's kind of a buffer zone. To catch up to TI, a company is going to have to spend four times its annual volume to reach the same level of sales," Strauss contends.

NEC, like AT&T, began its market focus on telecommunications applications, an area for which both companies have large captive markets, according to NEC's George Wang, DSP product line manager. "DSP is a major focus for

1988 digital signal processor market

Worldwide sales of general purpose DSPs



Total 1988 market: $222 million

Source: Forward Concepts

NEC," says Wang. But, he admits, the company's level of support, while "superior," can't match TI's. NEC is banking on its status as the world's largest supplier of semiconductors and its loyal customers to build market share.

Fujitsu admits it doesn't have the facilities to offer the widespread customer support offered by TI. According to Paul McGuire, product marketing engineer for Fujitsu's DSPs, the company is depending on developers who already have experience in digital signal processing to increase its market share.

"TI is spread so thin they lose contact with their customers," McGuire contends. "Our philosophy is to work one-to-one with engineering, to develop that relationship, and get repeat business. We'll leave the training to TI, and deal with the DSP user," says McGuire. Fujitsu hopes its newest 32-bit DSP, which is the first to include support for the IEEE-754 standard for floating-point math operations on silicon (other makers rely on software), will attract users who need ICs that are compatible with existing software databases, many of which use the IEEE standard.

Price wars

Price, the major DSP makers agree, will be a key factor in growing the market by making new applications economically viable. As the largest single consumer of DSP chips in the United States, AT&T is still expanding its merchant capacity. Strauss estimates that its merchant sales ($10 million to $12 million this year), are only one-tenth its internal usage. AT&T is competing on price. AT&T's low-end 32-bit DSP is now priced at less than $50 each, while other companies' chips run well over $100 each.

AT&T isn't attempting to buy market share with its stripped-down prices, says Charlie Mera, technical support engineer for DSP, but the company can afford to offer low prices because AT&T's architecture allows the circuits to be about half the size of its competitors.' And, AT&T can leverage from a process technology that is driven by a large base of captive applications.

The AT&T 32-bit DSP, for example, is now priced competitively with the math coprocessors that are used in desktop computers. "You can sell a DSP-based add-in card for less than $1,000," says Mera, "while it costs you more than $500 for a single 80387 math coprocessor IC." And, the DSP card does math operation in a single cycle, compared with about 20 cycles for the 80387 solution, according to Mera.

TI lags behind AT&T in price. It's not projecting $100 prices for its 32-bit DSPs until next year sometime, says a spokesman. But TI's sell is the total system cost, says Haimes. This means the cost of not only the DSP chip, but the cost of peripherals and memory. TI's most recent introduction, the 320C5X, reportedly features the largest amount of on-chip memory of any DSP, saving users money for memory, Haimes stresses.

SASHA LEWIS

What people think about your company may have more to do with your success in the marketplace than anything else.

Electronic Business

The outlook for Unix

Sales of Unix-based systems are expected to grow from last year's $8.2 billion to $26.4 billion by 1993, a compound annual growth rate of 26%, according to the International Data Corp. market research firm in Framingham, Mass.

"If you stop looking at just PCs and look at the whole computer industry, Unix is just outgrowing everything else," says IDC analyst David Card.

Despite earlier fears that the schism within the Unix world would slow its acceptance among users, most vendors and industry watchers now believe that the imbroglio over the operating system's future, and the resulting publicity, has actually increased its growth rate.

"If no one is fighting over it, it's not important," concludes Michael Tilson, president of HCR Corp., a Toronto-based developer of Unix system software. He says that the born-again interest in Unix shown by IBM and Digital Equipment Corp. has also "caused people to sit up and take notice."

Unix, nevertheless, has its skeptics. A recent report from the Boston-based Aberdeen Group consulting firm concludes that Unix has failed to live up to its promise to provide users with hardware independence and that the "Unix Tower of Babel" will not disappear this year or next.

A big question is how well Unix will compete against OS/2, the successor to the ubiquitous DOS.

This year some 490,000 Unix-based CPUs will be shipped, compared with 2.9 million CPUs running OS/2, according to the Dataquest Inc. market research firm in San Jose. By 1992, shipments of CPUs running Unix will increase to 960,000, but sales of OS/2-based CPUs will grow to 12 million.

Unix, however, is a multiuser operating system while OS/2 is single-user. Last October, AT&T shipped its millionth Unix license and Novon Research Group research director Brian Boyle estimates that adds up to some 7.5 million Unix users.

Dataquest concludes that both Unix and OS/2 "will be winners in the fight for control of the desktop operating system."

Another major factor in the future of Unix is the amount of support it will receive from IBM. Although Big Blue has been sinking vast resources into developing Unix-based products, the company appears to be putting more emphasis on OS/2 for its desktop systems. Last month's introduction of the Officevision family of software — based on OS/2 — was seen as another step in that direction.

The Aberdeen study concludes that Unix could catch on more quickly if "shrink-wrap" software, portable applications sold through dealer and retail channels, becomes more available. But in a chicken-and-egg scenario, observers say Unix must become a standard before such software becomes more prevalent.

"As soon as there is a certain amount of standardization, then shrink-wrap becomes more and more a possibility," says Raymond Anderson, president of IXI Ltd., a Cambridge, England, developer of a desktop manager graphical interface.

But Anderson urges caution for software developers looking to cash in on an expected Unix market. "Anyone in this business has to have a reasonable amount of conservatism in their view of the long term," he says, adding that vendors in the past have "had their fingers burned" when growth projections exceeded reality.

James Barclay, DEC software technology consultant, predicts that by 2010, the only operating systems will be Unix, IBM's MVS, DEC's VMS, and OS/2 or DOS on the desktop, although some add Apple Computer Inc.'s MacOS to the list.

While there have been attempts to create new operating systems, such as the Japanese effort to develop the Tron operating system, few industry watchers expect anything to replace Unix any time soon.

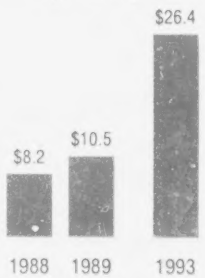
"It's very difficult for me to believe that someone is going to sit down and write another operating system from scratch," concludes J. Thomas West, systems development division senior vice president at Data General Corp.

Boyle agrees that the growth of Unix could slow. "To go from 1% of the [computer] market to 21% of the market is a lot easier than to go from 21% to 41%." Although he believes that Unix will account for the largest number of users of any operating system, he still does not see it exceeding one-third of all computer users. □

Unix market and leaders

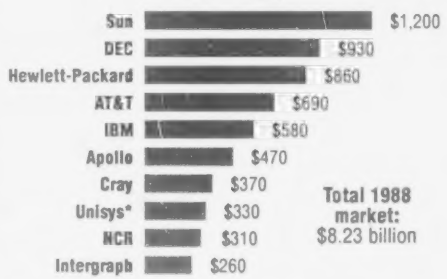
Worldwide value of shipments by U.S.-based vendors

Total Unix market
($ billions)



Source: International Data Corp.

Top 1988 Unix system makers
($ millions)



* Includes Convergent, does not include OEM products

EDA: Marketing moves into the driver's seat

EDA's growing pains cause vendors to look to marketing as a way to respond to customer demands. There are major benefits to both buyers and sellers

BY TONY GREENE

A maturing market is forcing the major vendors in the electronic design automation, industry to focus strongly on marketing demands. The results are an increasing awareness of customer needs and more involvement of customers in the product development cycle.

A design environment that is at once more extensive and more complex is causing marketing to replace technology as the driving force behind EDA. Customer demand for integrated systems is a major trend. "When you start talking about horizontal and vertical integration, marketing starts having a great effect. You have to win the hearts and minds of customers and you do that with marketing," says Charles M. Foundyller, president of Daratech Inc., a Cambridge, Massachusetts-based market research firm. This increased focus on marketing is giving vendors new insight into product development and a chance to solidify and enlarge their installed base.

Difficult transition

For many companies the transition to being market driven may not be easy. "Many of these companies were engineering driven," notes Bruce Bourbon, vice president for marketing for Cadence Design Systems Inc. of San Jose. Still, almost all of the major players have recognized the importance of marketing and are positioning their strategies to become more responsive to the market.

The one company that always had a marketing focus is Mentor Graphics Corp. of Beaverton, Ore., the industry leader with 1988 sales of $301 million. With its strongly marketing-based strategy, Mentor has achieved a dominant position in the EDA world, controlling a 24.2% share of the $1.2 billion in revenue generated last year by U.S. vendors worldwide.

Mentor intends to continue on the course that took the company to number one. "I don't think there is any question that marketing is important in EDA. [Marketing] is just as important to us as the quality of the products," says Mentor's group vice president, Frank Costa. "Internally, marketing has equal weight with technology. We want to be a market-driven company." About 10% of Mentor employees work in marketing.

A strong marketing influence shows clearly in Mentor's product development process. The formalized, eight-step process has been designed to involve the customer in at least half of the stages. This kind of formalized process is a good example of the methods being employed industry-wide to meet customer needs.

Mentor's Frank Costa: "Marketing is just as important to us as the quality of the products"

This is how Mentor's design process works:

- 1. Marketing writes a requirements document for a new product or an enhancement of an existing product.
- 2. A project team composed of people from marketing, engineering, service, training and quality assurance is assembled.
- 3. Customers are brought in and acquainted with the idea; their input is incorporated.
- 4. A functional specification is written. The product will be developed from this specification.
- 5. The customer is brought in to comment on the specification.
- 6. Development starts. At this point engineers start generating code.
- 7. Alpha testing is done. Customers are brought in to use the product with development engineers.
- 8. Beta testing is done, usually at customer sites.

The benefits of listening to customers are clear. For example, during recent alpha testing on Mentor's Quickgrade product, a high-speed fault grading tool, a major customer suggested that the information gathered for the fault grading would also be useful for logic design. The trick for Mentor was to get the information to the engineer in an easy-to-use format. Mentor managed to incorporate the change in the beta release of the product. The enhancement to Quickgrade has opened up a new market channel for the product. What's more, the customer who made the suggestion has decided to buy several hundred copies of the product because of the new feature alone.

This process of product development — marketing initiated, with intense customer input — has been one of the keys to Mentor's success. Another key to Mentor's winning strategy is a company-wide attitude. "Everybody at Mentor thinks of themselves

as marketing people," says Costa.

The importance of marketing has not escaped Mentor's competitors. Strategies that reflect the growing need to be responsive to customer needs are being implemented throughout the industry. Companies such as Daisy/Cadnetix, Valid Logic Systems and Cadence have all perceived a need for a market-driven strategy. "In the past they [EDA vendors] made tools we could use but it was their vision. There has definitely been a change: products are more integrated and on more platforms so we aren't held hostage by the vendor. These changes all came out of customer needs," says Dave Evans, manager of integrated electronic design systems for General Dynamics Corp. in San Diego.

But that doesn't mean that customers are completely satisfied. "The major EDA vendors are still focused on the short term. They have a weakness in the area of looking at where I need to be in five years," says Evans.

From Valid Logic Systems Inc.'s perspective, the need to build sales into big accounts is one of the major drivers for a marketing-based strategy. "From an industry standpoint, [marketing] is important because there are still quite a few folks who are decision makers in large companies that have to buy our product. A lot of the reason for marketing is to expose them to what CAE can do," says Robert Moore, vice president for sales of the San Jose-based company. Valid spends approximately 6% of sales revenue on marketing.

Valid's Robert Moore: "Marketing is the keeper of the balance between engineering and customer needs"

Historically, Valid was an engineering driven company where marketing received finished products but had limited input into the development process. Those days are gone. "Marketing is leading the charge saying, 'Here are the areas we need to go address,' " says Valid's director of product marketing Richard Albright. This is where Valid touches base with its customers' needs and views on the direction of product development. In the last year Valid has initiated a seven step product development cycle that starts in marketing and proceeds through alpha and beta testing. "Marketing is the keeper of the balance between engineering and customer needs," says Moore.

One of the major developments of Valid's recent marketing bent is the concept of network licensed software. Traditionally, EDA software has been nodally locked. This meant that each workstation was dedicated to a specific function and was resource-shared by engineers who had to move from station to station to complete a design. Because the industry has shifted to standard hardware platforms that are frequently networked, customers want to run multiple software applications on a workstation. Another factor fueling this desire is the ever-decreasing cost of workstations and the increasing feasibility of putting a workstation on every engineer's desk.

Driven by these factors, Valid developed Access, a product that allows network access to their design tools. This allows customers to buy the number and type of tools they need based on projected usage. "Valid was kind of forced into [the network access strategy] because they support DEC and Sun. Both are heavily networked," says Daratech's Foundyller.

Customer needs have also become a driving force at the recently merged Daisy/Cadnetix Inc. [Dazix], now the number two EDA vendor with 17.6% of the market. "We define product, hopefully by understanding the market's needs. To be successful you have to understand the market envi-

EDA vendors and customers learn the benefits of marketing

Benefits to the vendor

- Products developed in order to meet customer needs are easier to sell
- Markets for products are defined before the products are ready for sale
- Customers are more inclined to buy a product that they contributed to during development
- Potential customers are more aware of the capabilities of vendors and their products
- Marketing gives vendors a clearer definition of their products' strengths and weaknesses

Benefits to the customer

- Key customers know about and can be using products before initial release. This gives them a greater buy in on the product and increases vendor loyalty
- Customers are happier because they feel their needs are being actively considered
- Products can be tuned to the needs of the market and the installed base
- New ideas for use of the product arise that can open new market channels
- Customers have less room to complain that they are not getting what they want

ronment, the technical environment and the competitive environment," says O.B. Feltman, senior vice president for marketing for Dazix. The key to Dazix's strategy is a solutions approach. "Our mission statement is to be a solutions company, not a product company," says Feltman.

Selling solutions

When the focus shifts to selling solutions more than products, that leads to a different type of sale than has been traditional in the EDA market. "An increased percentage of our business is with large accounts," says Valid's Moore. This is the trend for all the major players in the EDA arena. Mentor has concentrated on the big account sales approach for several years. Valid and Dazix are rapidly tuning their marketing efforts toward big accounts.

Focusing on large accounts means making a significant investment over a longer period of time. For many in the EDA industry this is a change of perspective. "In the past most CAE companies have been driven by quarterly numbers," says Moore. Valid had roughly 20 sales of the million-dollar size in 1988. Mentor has seen the number of million-dollar sales rise from 12 in 1987 to 43 in 1988.

Large account sales mean more than longer sales cycles; they also mean a different approach to marketing. This shows up clearly in advertising and public relations. "We have a

Cadence's Bruce Bourbon: Marketing gives everyone the feeling that they contributed

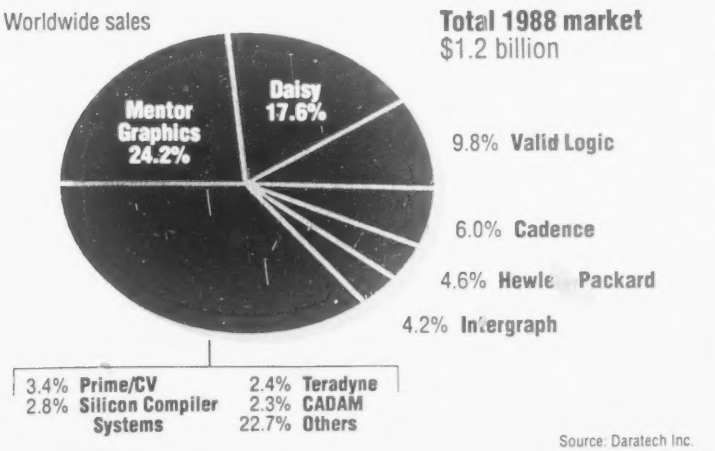
fairly narrow group of customers. Advertising is used to position the company in the market to try to communicate a global technology message," according to Cadence's Bourbon. Cadence is spending 5% to 7% of sales revenue on marketing. The major EDA vendors see advertising and public relations in today's environment as a way to position the company as a whole. With public relations and advertising being used to position the company with upper level management, direct mail and seminars are more precise methods of reaching the actual engineering user.

The smaller players in the EDA arena also recognize the importance of marketing. "It is how you decide what products you build. Marketing is the most important factor for anyone who is not the absolute market leader. For everyone who is not the market leader, marketing is a game of: what you are strong at, how can you distribute the product and what will the competition look like," says Joseph Lassiter, vice president of Teradyne Inc.'s Santa Clara, California-based EDA group. Teradyne's strategy relies on leveraging off a customer base that is already an EDA buyer from one of the major players. "We are typically selling into a DMV [Daisy/Mentor/Valid] environment rather than replacing them. We sell specific tools," says Lassiter. Teradyne sells simulation and test generation tools that are designed to be integrated into other design environments.

Gateway Design Automation Corp., of Lowell, Mass., is another small company that has recently emphasized marketing. "Even if it is a technical sell you still have to win the customers' mind. We had a session specifically on strategy to listen to the customer. You'd be surprised how much we learned," remarks Gateway's president and founder Prabhu Goel. One of the lessons learned by Gateway was that its customers wanted direct access to data structures in the Verilog product in order to integrate Gateway tools into a heterogenous design environment. In response to this, Gateway developed the Verilink product which gives the access needed. This will be used by customers who need to do mixed analog/digital simulation as well as ASIC suppliers who want to use Verilog with their ASIC design toolkit.

The things that can be learned from customers and the benefits that can be gained by learning them are essential to the growing importance of marketing in the EDA world. "Marketing is the process of creating products. It turns out that it is the process that is important. It ultimately gives everyone the feeling that they contributed. The process gives them the 'buy in,'" says Cadence's Bourbon. □

1988 EDA sales by U.S. vendors



Source: Daratech Inc.

Stagflation, here we come: U.S. growth slows into 1990

Brake time for the U.S. economy; electronics-sector growth is forecast to slow 5.6% this year and 2.3% in 1990 as inflation settles in at 6%

BY BRUCE C.P. RAYNER

There is no doubt that the economy is slowing down and will continue to slow into 1990. But while forecasts of recession have filled the headlines these past few months, the broader consensus is that a soft landing is more likely — as long as the Federal Reserve Board does not pull any fast ones and as long as the U.S. government does not go on a protectionist rampage.

Cahners Economics, the research arm of Cahners Publishing Co., expects no calamities in the next nine months. While the economy will head south this quarter as the Fed's tight money policy has the desired effect, it will rebound next quarter. (It takes two consecutive quarters of negative growth to qualify for a recession.)

Gross National Product, the total output of the U.S. economy, will average 2.47% growth for the year, Cahners predicts. This is slower than the 3.86% growth rate posted last year, but is faster than the 2.19% rate Cahners forecasts for 1990.

The pattern will be mirrored in the behavior of the electronics sector: Cahners forecasts that the U.S. electronics production index will sag from 112.4 for the first quarter of 1989 to 111.53 for the last quarter (based on a first-quarter 1987 base of 100), showing no improvement until midway through 1990.

Others see the same coming. Henderson Ventures, an electronics forecasting firm in Los Altos, Calif., puts electronics at a 5.6% annual growth rate this year and only 2.3% next year.

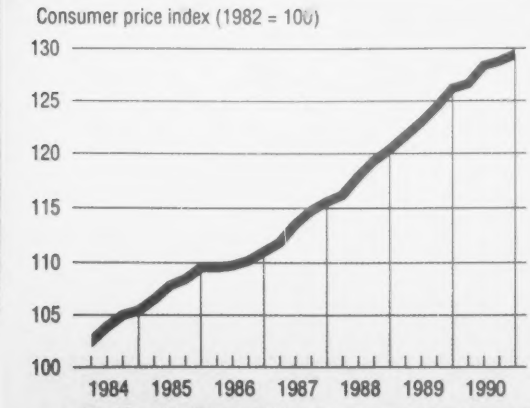
And economists at the U.S. electronics industry's leading corporations are in accord. ELECTRONIC BUSINESS elicited the best projections from the economic gurus at: AT&T, Digital Equipment Corp., Hewlett-Packard Co., General Electric Co., 3M Co., Texas Instruments Inc. and Unisys Corp., and found their numbers amazingly consistent.

Like Cahners, most of those surveyed expect a soft landing, but a recession should not be ruled out, they say. The probability they assign to a recession hovers around 40%. Their consensus puts overall U.S. GNP growth in 1989 around 2.7%, dropping to around 1.75% in 1990. The low point will be the fourth quarter of 1989 or the first quarter of 1990.

Electronics executives share the somewhat sanguine vision of the future. They are seeing the slowdown but most expect it to be mild. Orders

The economy

As inflation rises...



Data source: U.S. Department of Commerce; Forecast: Cahners Economics

...and interest rates peak...

Data source: Federal Reserve Board; Forecast: Cahners Economics

have been slowing for the last six months and sales are expected to be sluggish through early 1990. Fred Cox, president and CEO of $150 million Emulex Corp. sums it up well: "I'm not bullish but I'm not pessimistic either. I haven't seen enough signs to go into a contingency plan."

Economists' recommendations for dealing with the slowdown range from tightening cost control to targeting foreign growth markets. A common theme is the need to continue investment in productivity-enhancing equipment both as a way to improve competitiveness and as a way to fight rising labor costs. But above all, "conservative planning is the order of the day," insists Richard O'Brien, corporate economist at Hewlett-Packard.

Stagflation

While the recession issue can be debated to death, the real long-term worry is "stagflation." That is, economic stagnation combined with inflation. The reason is that cost-push inflation has taken hold and is hard to purge. While 1970s style double-digit inflation is not expected, economists predict it will hover around 6% for the next couple of years. Anything over 4% is too high, say both academics and policy makers.

But there is little that can be done to force the economy into line. The problem is weak fundamentals. "The financial system is fragile, the manufacturing sector is more leveraged, the trade and budget deficits are infinitely more worrisome than they were 10 years ago and a policy of monetary stringency puts all that at greater risk," says Everett Ehrlich, vice president for economic analysis at Unisys.

If interest rates go too high, the system could collapse. Alternatively, as the economy cools, lower interest rates become a mixed blessing. They are good for the domestic economy but bad for the budget deficit. They also will lead to a lower dollar, which is good for exports but increases direct foreign investment in the United States.

Economists are predicting interest rates to drop over the next year

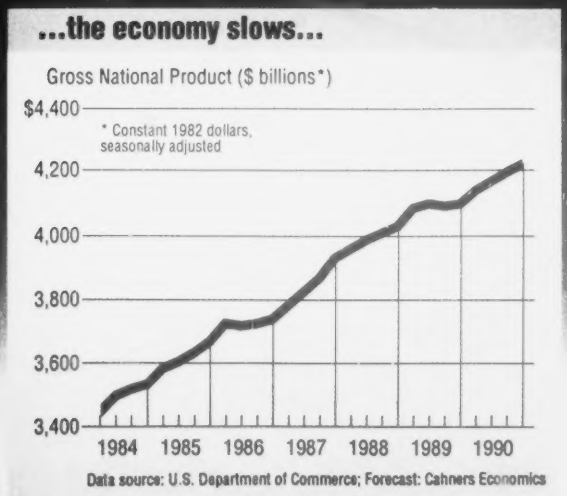
Assuming nothing too unexpected happens, economists are predicting interest rates to drop over the next year. Data Resources Inc. (DRI) puts the prime rate at 9.5% in 1990; down from a high of 11.35% this year.

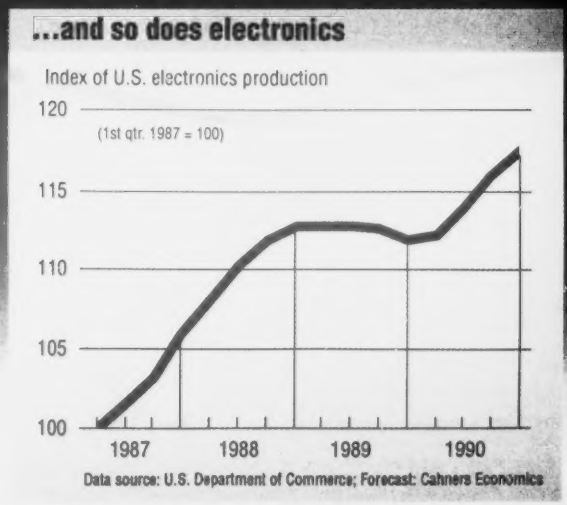
As a result, the dollar will also fall by maybe 10% and inflation will stabilize between 5.5% and 6%. Coupled with less than 2% GNP growth, the economy looks like it is catching a low-grade variety of the stagflation virus. According to Ehrlich at Unisys, stagflation will hang around "until the U.S. addresses its budget and trade imbalances."

Electronics cycles in synch

For the U.S. electronics industry — at around $250 billion in production a year, it's the largest U.S. manufacturing segment, bigger than either automobiles or chemicals — this has considerable implications, especially as the industry matures. It is taking on more of the characteristics of a traditional capital goods market with less pronounced growth cycles. Consequently, says DRI's director of forecasting Christopher Caton, "the electronics industry has become more integrated and will follow the business cycle of the rest of the macroeconomy."

Generally speaking, capital goods spending in the United States peaked in 1988, driven largely by a weaker dollar, and has been slowing ever since. James Whittaker, chief economist at DEC, expects capital spending to be weak in 1989 and even weaker in 1990 as the economy slows. Spending on computers in the United States will increase by between 5% and 8% in 1989, down from 11% growth in 1988, and will drop





to increases of between 1% and 3% in 1990, he says.

Of course, most electronics companies consider themselves the exception to the rule. Either they are in a high growth segment divorced from the rest of the economy or their product has a life cycle all its own. Even so, macroeconomic effects will creep in.

Take Hilevel Technology Inc., a $10 million-plus ASIC design and verification tools company. Although it is tied to its customers' design starts, which are for the most part independent of economic fluctuations, it is feeling the macroeconomic pinch. The gestation period of orders, usually a few weeks, has stretched out to three to six months. "It's a reflection of uncertainty," says Norbert Laengrich, Hilevel's vice president for marketing.

Still, electronics is better insulated than most other industries from the vagaries of economic ups and downs. Computer sales will still be driven in part by technological improvements that push the cost of computational power down. Case in point is the workstation market, slated to grow at above 40% no matter what happens to the economy. Also, telecommunications looks healthier than average.

There are other exceptions, too. Capital investments for the purpose of cost control and productivity improvement are more likely to be made during a recession than capital investment for the sake of expansion. As competitive pressures increase between the Far East, the United States and Europe, a growing percentage of capital investments in electronic equipment is being made for these reasons, economists say.

One way to grow through a slowdown is to target growth markets. "Contractions and expansions are never synchronized, there is always an economy somewhere that is taking off," comments Alan Reynolds, chief economist at Polyconomics Inc., a supply side economic consulting firm in Morristown, N.J.

Suggestions for dealing with the slowdown range from tightening costs to targeting foreign growth

Vladi Cato, chief economist at Texas Instruments Inc., agrees: "The global mindset is an absolute must in this day and age." If you are not already exporting, now is the time to get started, he says.

Europe is undergoing structural change in preparation for the end of 1992 when intra-European trade barriers will come down. This should spur sales. Likewise, Japan's economic growth is expected to outpace the United States' in the next few years. Says a Tektronix Inc. spokesperson: "We think most of our success will be driven by having the right products in the right markets." For the most part, that means Europe and the Far East.

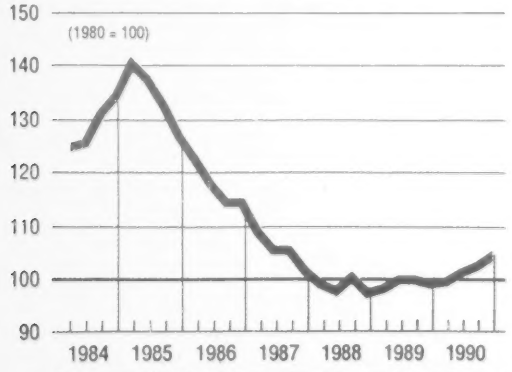
But there is a protectionism cloud brewing on the export horizon. The Bush administration's Trade Representative, Carla Hills, has compiled a list of 34 of America's worst trade offenders and is devising a scheme of how to deal with them. Of particular concern to Hills is the lack of access to Japan's telecommunications markets afforded U.S. vendors.

Critics warn that retaliation could plunge the world into deep recession. "I think one of the major risks we face over the next few years is the risk of increased protectionism," warns TI's Cato.

Even Michael Boskin, chairman of the President's Council of Economic Advisors, has warned of a trade war and resulting stagnation in the world economy if the U.S. retaliates against its trading partners. Boskin's concern has historical precedence. It was the Smoot-Hawley Tariff Act, a piece of protectionist legislation that helped tip the United States into the Great Depression. □

Value of the dollar

Index of the dollar value against 16 trading partners



Data source: Atlanta Federal Reserve Board; Forecast: Cahners Economics

Electronics output by segment

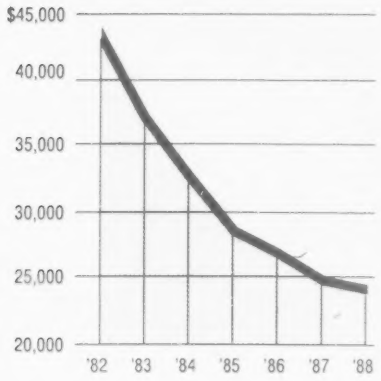
Percentage growth in current dollars

	1987	1988	1989	1990
Communications	5.0%	7.2%	5.8%	4.2%
Computer & office	6.5%	10.9%	7.7%	1.7%
Industrial & instruments	4.3%	14.3%	8.1%	3.9%
Commercial subtotal	**5.6%**	**10.9%**	**7.4%**	**2.9%**
Military	**2.6%**	**2.9%**	**1.4%**	**2.5%**
Consumer	**-1.8%**	**6.8%**	**3.1%**	**-4.5%**
Total	**4.2%**	**8.5%**	**5.6%**	**2.3%**

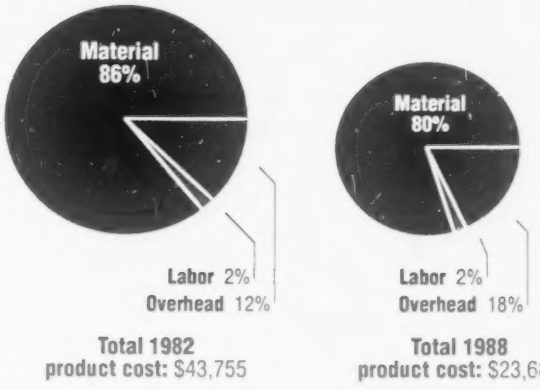
Data source: Henderson Ventures

Electronics industry cost index

■ Since 1982, the composite product cost has decreased by 46%



■ Even though materials represent the highest percentage of product cost, the opportunities for controllable cost reductions are decreasing.



	1982	1984	1986	1988
Material				
• Processor/logic	$17,221	$11,338	$10,742	$9,960
• Memory	7,220	4,758	1,560	1,509
• Power, cabinet, etc.	4,160	4,668	4,859	5,432
• Peripherals	9,160	5,969	3,682	1,981
Subtotal	**$37,761**	**$26,733**	**$20,843**	**$18,882**
Labor				
• **Total dollars**	**$750**	**$536**	**$477**	**$412**
• Hours	120	175	60	48
• Dollars per hour	$6.25	$7.15	$7.95	$8.59
Overhead				
• Material overhead	$3,744	$3,526	$3,209	$2,625
• Manufacturing overhead	1,500	1,688	1,869	1,770
Subtotal	**$5,244**	**$5,214**	**$5,078**	**$4,395**
Total product cost	**$43,755**	**$32,483**	**$26,398**	**$23,689**

■ The bulk of the decline in material costs came from IC technology advances. Low-technology components, such as power supplies, cabinetry and packaging, are becoming an increasingly important area for cost reductions.

■ Despite higher labor rates, productivity gains still led to reduced total labor costs. But labor cost reductions may soon reach a limit.

■ Manufacturing efficiencies were offset by shrinking product life cycles and increased product complexity. Still, reducing overhead costs represents the best opportunity for cost reductions.

Source: Pittiglio, Rabin, Todd & McGrath

How the 1989 cost study was prepared

This study creates the electronics industry's version of a Consumer Market Basket Index. It provides a perspective on product cost trends by analyzing cost changes for a typical "composite product" using actual data for the years 1982-1987 and estimates for 1988. This approach measures the cost of supplying a product with fixed functionality using currently available technology.

One caveat: our methodology doesn't let the composite product improve in functionality the way acutal products do. In the "real world," our 1982 composite product would likely be outdated by 1988.

The composite product selected for this analysis has a cost-structure typical of product produced by many electronics manufacturers. It represents a systems product consisting of a 32-bit central processor with two megabytes of main memory. The system is configured in a one-bay rack with power supply. It includes 100 megabytes of disk storage, two terminals and a printer.

Although specific input and output devices, as well as software, will vary, the cost structure is consistent with many industry segment products. Examples of these products include CAD/CAM systems, minicomputers, automatic test equipment and intelligent workstations.

To quantify the change in the composite product's cost, PRTM created a representative product structure made up of nine modules and three peripherals. It then measured changes in the cost of the peripherals plus a dozen underlying material commodities and the effect of productivity gains in manufacturing processes and overhead operations. Where technology has shifted over the period of the study — the size of DRAM chips, for example — PRTM used average costs weighted by industry-wide mix of shipments.

PRTM obtained the data from Dataquest Inc., the Bureau of Labor Statistics, PRTM's proprietary benchmarking studies and its client base. □

Industry figures and forecasts

Electronic components

(SIC 367)

	1987	1988	1989	1990
New orders				
($ billions)	$48.56	$54.76	$52.09	$58.77
Shipments				
($ billions)	$47.15	$54.70	$54.95	$58.46
Inventory/shipment ratio	1.76	1.83	2.01	1.80
Production index				
(1977=100)	250.2	278.9	278.1	290.4

Electronic component leadtimes

Weeks from order to delivery

Active components	8.7	7.3	6.5	7.0
Integrated circuits	7.6	4.5	5.4	6.5
Memory circuits	9.6	9.7	7.1	7.6
Microprocessor ICs	8.6	8.9	7.4	7.5
Passive components	6.2	5.0	5.4	5.7
Capacitors	6.9	5.3	5.5	6.3
Connectors	7.2	5.2	6.4	6.7
Printed circuit boards	5.9	5.5	5.4	5.5

Computers and office equipment

(SIC 357)

New orders				
($ billions)	$60.69	$67.28	$66.89	$67.05
Shipments				
($ billions)	$61.18	$67.76	$67.93	$68.44
Inventory/shipment ratio	2.07	2.12	2.16	1.92
Production index				
(1977=100)	282.7	315.3	324.1	329.9

Communication equipment

(SIC 366)

New orders				
($ billions)	$70.71	$72.96	$71.06	$74.68
Shipments				
($ billions)	$70.63	$74.24	$74.97	$75.86
Inventory/shipment ratio	2.63	2.36	2.55	2.53
Production index				
(1977=100)	220.9	219.0	212.9	213.9

Instruments and controls

(SIC 381-4)

	1987	1988	1989	1990
New orders				
($ billions)	$45.60	$49.93	$51.19	$53.48
Shipments				
($ billions)	$44.66	$48.91	$51.15	$52.76
Inventory/shipment ratio	2.44	2.41	2.40	2.37
Production index				
(1977=100)	172.0	185.0	195.7	201.2
ATE sales index				
(1Q 1976=100)	660.6	827.6	867.1	887.1

Consumer electronics

(SIC 365)

Shipments				
($ billions)	$11.47	$11.45	$12.29	$13.10
Production index				
(1977=100)	155.2	155.5	159.0	167.1
Color TV sales				
(millions of units)	19.33	20.22	22.53	24.00
VCR sales				
(millions of units)	13.31	12.79	12.67	12.62

Semiconductors

North American market

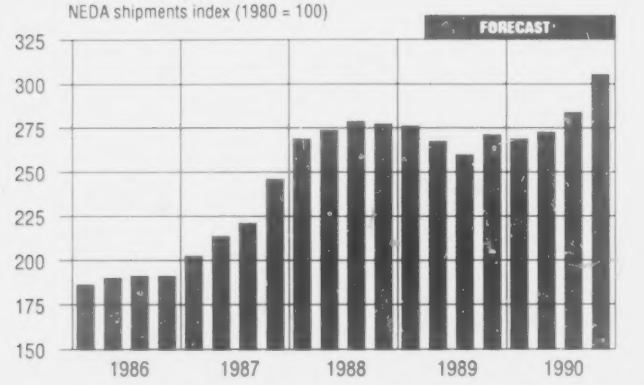
IC shipments				
($ billions)	$8.61	$11.51	$12.58	$13.25
Discrete shipments				
($ billions)	$1.65	$1.91	$1.81	$1.92
Total semiconductor shipments				
($ billions)	$10.23	$13.42	$14.39	$15.17
Book-to-bill ratio	1.14	0.98	1.01	1.13

Defense

Defense & space production				
(1977=100)	188.8	185.9	175.6	165.3
Aircraft & parts production				
(1977=100)	168.5	168.0	167.6	169.2
Aircraft & parts shipments				
($ billions)	$103.4	$107.7	$107.5	$106.7

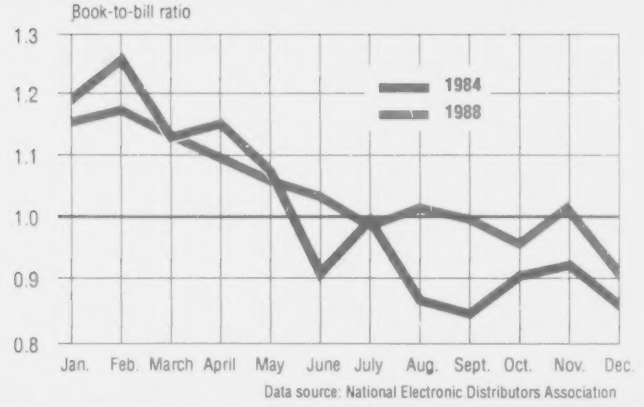
Compiled by Julie Handelman, Cahners Economics

Expect distributor shipments to slip only a bit...



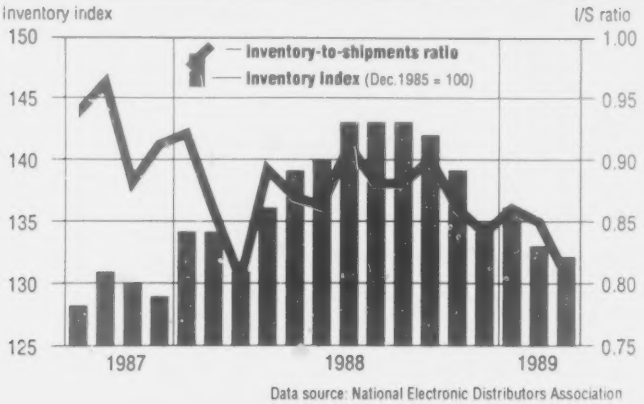
Data source: National Electronic Distributors Association; Forecast: Cahners Economics

...since the book-to-bill ratio has been healthier...



Data source: National Electronic Distributors Association

...and inventory remains under control



Data source: National Electronic Distributors Association

A bearable downturn for distributors this year

Whether distributors like it or not, the economic business cycle does have an impact on their sales. Unfortunately, sales in 1989 are following the downward portion of the business cycle curve now.

According to the National Electronic Distributors Association (NEDA), shipments rose 2.6% in the first quarter of 1989 above first-quarter 1988 levels. March shipments actually fell 0.8% below year-ago levels. That, by the way, was the first monthly decline from the year-ago level since January 1986.

News from NEDA on the orders front clearly show the economic downturn has begun as well. New orders to distributors fell 10.3% in the first quarter of 1989 from year-ago levels. At a 12-month moving annual pace, orders in March rose only 7.4%, down from the speedy 31% rate of the previous summer.

No one disputes now that distributors' growth has slowed from 1988's bountiful path. The only question remaining: How far down do distributors have to go before sales head up again? The prognosis doesn't look too gloomy, especially compared with 1985, when NEDA orders tumbled 29%. This time around, Cahners Economics forecasts shipments will inch down only 2% and orders down 10% in 1989.

Good signals from the ELECTRONIC BUSINESS Leading Indicator, help from excellent inventory control and a "no recession assumption" are playing key roles in making the 1989 downturn so bearable.

Notes from the front line: In response to the March 20th column, Toby Mack of NEDA called to caution us with using Semiconductor Industry Association distributor sales figures. Don't forget, he warns, these are sales reported by manufacturers to distributors, so they should be read somewhat differently than the data NEDA reports. The semiconductor sales were much more volatile in 1984 and 1985 than NEDA shipments.

Cahners Economics and ELECTRONIC BUSINESS' sister publication, *Electronics Purchasing*, presented a paper at the Electronic Distribution Show in Las Vegas last month on how to use business cycles and the ELECTRONIC BUSINESS Leading Indicator to forecast distributor sales. For a free copy, please call me at (617) 558-4368 or write me at Cahners Economics, Cahners Publishing Co., 275 Washington Street, Newton, Mass., 02158-1630.

ELIZABETH BAATZ

A column on distributors will appear again on Sept. 18th.